WHAT IS CLAIMED IS:

1. A variable capacitor structure, comprising:

a substrate;

a first type ion-doped well within the substrate, wherein the first type ion-doped well has a cavity;

a first-type ion-doped buried layer in the substrate underneath the first type ion-doped well, wherein the first type ion-doped buried layer and the first type ion-doped well are connected;

a second type ion-doped region at the bottom of the cavity of the first type ion-doped well; and

a conductive layer over the first type ion-doped buried layer, wherein the conductive layer and the first type ion-doped buried layer are connected.

2. The variable capacitor of claim 1, wherein the structure further includes a first metal silicide layer over the second type ion-doped region.

3. The variable capacitor of claim 1, wherein the conductive layer further includes a second type ion-doped deep collector region.

4. The variable capacitor of claim 3, wherein the structure further includes a second metal silicide layer over the second type ion-doped deep collector region.

5. The variable capacitor of claim 1, wherein the conductive layer includes a contact.

6. The variable capacitor of claim 5, wherein the second type ion-doped region and the conductive layer are located within the same active device region of the substrate, and the conductive layer is isolated from the second type ion-doped region through an insulation layer.

7. The variable capacitor of claim 1, wherein the structure further includes a second metal silicide layer between the first type ion-doped buried layer and the conductive layer.

8. The variable capacitor of claim 1, wherein the structure further includes an isolation structure within the first type ion-doped well between the second type ion-doped region and the conductive layer.

9. The variable capacitor of claim 1, wherein the first type ion-doped buried layer is an N-type buried layer and the second type ion-doped region is a P-doped region.

10. A variable capacitor structure, comprising:

a substrate;

a first type ion-doped well within the substrate, wherein the first type ion-doped region has a shallow trench isolation structure;

a first type ion-doped buried layer in the substrate underneath the first type ion-doped well, wherein the first type ion-doped buried layer and the first type ion-doped well are connected;

at least one second type ion-doped region in the first type ion-doped well at the bottom of the shallow trench isolation structure; and

at least one first conductive layer connected to the first type ion-doped buried layer.

11. The variable capacitor of claim 10, wherein the first type ion-doped buried layer is an N-type buried layer and the second type ion-doped region is a P-doped region.

12. The variable capacitor of claim 10, wherein the structure further includes at least a second conductive layer connected with the second type ion-doped region.

13. The variable capacitor of claim 10, wherein the structure further includes a metal silicide layer between the first type ion-doped buried layer and the first conductive layer.

14. A method of forming a variable capacitor, comprising the steps of:

providing a substrate having a first type ion-doped buried layer and a first type ion-doped well, wherein the first type ion-doped buried layer is above and in connection to the first type ion-doped well;

forming a conductive layer in the substrate above the first type ion-doped buried layer;

removing a portion of the first type ion-doped well to form at least one first opening without exposing the first type ion-doped buried layer; and

forming a second type ion-doped region in the first type ion-doped well at the bottom of the first opening.

15. The method of claim 14, wherein the conductive layer is formed before the first opening, including:

forming a second type ion-doped deep collector region in the substrate above the first type ion-doped buried layer such that the second type ion-doped deep collector region and the first type ion-doped buried layer are connected.

16. The method of claim 14, wherein the conductive layer is formed after the second type ion-doped region, including:

removing a portion of the second type ion-doped region and a portion of the first type ion-doped well between the second type ion-doped region and the first type ion-doped buried layer to form a second opening that exposes a portion of the first type ion-doped buried layer; and

depositing conductive material into the second opening.

17. The method of claim 16, wherein the second opening and the first opening are formed in different active device regions of the substrate.

18. The method of claim 16, wherein the second opening and the first opening are formed in the same active device region of the substrate.

19. The method of claim 16, wherein after the step of forming the second opening, further includes forming a second isolation spacer.

20. The method of claim 14, wherein after the step of forming the second type ion-doped region, further includes forming a metal silicide layer on the second type ion-doped region and the conductive layer.

21. The method of claim 14, wherein between the step of forming the opening and the second type ion-doped region, further includes forming a first isolation spacer on the sidewalls of the first opening.

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22. A method of forming a variable capacitor, comprising the steps of:

providing a substrate having a first type ion-doped buried layer and a first type ion-doped well, wherein the first type ion-doped buried layer is above and in connection to the first type ion-doped well;

forming a shallow trench isolation structure in the first type ion-doped well;

removing a portion of the first type ion-doped well to form an opening that exposes the first type ion-doped buried layer;

forming a dielectric layer over the substrate;

forming at least one first contact opening and at least one second contact opening in the dielectric layer, wherein the first contact opening exposes a portion of the

metal silicide layer and the second contact opening exposes the first type ion-doped well at the bottom of the shallow trench isolation structure;

forming a second type ion-doped region in the first type ion-doped region at the bottom of the shallow trench isolation structure; and

forming a contact inside the first contact opening and the second contact opening.

23. The method of claim 22, wherein the step of forming the second type ion-doped region includes:

conducting an ion implant operation to form the second type ion-doped region in the first type ion-doped well at the bottom of the second contact opening.

24. The method of claim 22, wherein the second type ion-doped region is formed in the same step as forming the shallow trench isolation structure, and the step of forming the second type ion-doped region and the shallow trench isolation structure includes the sub-steps of:

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forming a shallow trench isolation opening in the first type ion-doped well;

conducting an ion implant operation to form the second type ion-doped region in the first type ion-doped well at the bottom of the shallow trench isolation opening; and

forming the shallow trench isolation structure inside the shallow trench isolation opening.

25. The method of claim 24, wherein the variable capacitor further includes a liner layer within the shallow trench isolation opening.

26. The method of claim 22, wherein between the step of forming the opening and the step of forming the dielectric layer, further includes forming a metal silicide layer on the first type ion-doped buried layer.

27. The method of claim 26, wherein between the step of forming the opening and the metal silicide layer, further includes forming a spacer on each sidewall of the opening.